Title: Performance of coastal sea-defense infrastructure at El Jadida (Morocco) against tsunami threat: lessons learned from the Japanese 11 March 2011 tsunami

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Abstract: This paper seeks to investigate the effectiveness of sea-defense structures in preventing/reducing the tsunami overtopping as well as evaluating the resulting tsunami impact at El Jadida, Morocco. Different tsunami wave conditions are generated by considering various earthquake scenarios of magnitudes ranging from M-w = 8.0 to M-w = 8.6. These scenarios represent the main active earthquake faults in the SW Iberia margin and are consistent with two past events that generated tsunamis along the Atlantic coast of Morocco. The behavior of incident tsunami waves when interacting with coastal infrastructures is analyzed on the basis of numerical simulations of near-shore tsunami waves' propagation. Tsunami impact at the affected site is assessed through computing inundation and current velocity using a high-resolution digital terrain model that incorporates bathymetric, topographic and coastal structures data. Results, in terms of near-shore tsunami propagation snapshots, waves' interaction with coastal barriers, and spatial distributions of flow depths and speeds, are presented and discussed in light of what was observed during the 2011 Tohoku-oki tsunami. Predicted results show different levels of impact that different tsunami wave conditions could generate in the region. Existing coastal barriers around the El Jadida harbour succeeded in reflecting relatively small waves generated by some scenarios, but failed in preventing the overtopping caused by waves from others. Considering the scenario highly impacting the El Jadida coast, significant inundations are computed at the sandy beach and unprotected areas. The modeled dramatic tsunami impact in the region shows the need for additional tsunami standards not only for sea-defense structures but also for the coastal dwellings and houses to provide potential in-place evacuation.

KeywordPlus: 1755 Lisbon Earthquake; 1755-Like Tsunami; Portugal; Southwest; Deposits; Catalog; Events; Faults; Hazard; Spain

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